AMENDMENTS TO THE CLAIMS

This listing of claims will replace all prior versions and listings of claims in the

application:

LISTING OF CLAIMS:

1.   (canceled).

2.   (Previously Presented): A shape descriptor extracting method comprising:

(a) extracting a skeleton from an input image;

(b) obtaining a first list of straight lines by connecting pixels based on the extracted

skeleton; and

(c) determining a second list of straight lines obtained by normalizing the first list of

straight lines as a shape descriptor,

wherein (b) comprises connecting pixels having a same level on direction maps of a

plurality of directions to obtain the first list of straight lines.

3. (original): The method of claim 2, wherein the step (a) comprises:

(a-1) obtaining a distance map by performing a distance transform on the input image;

and

(a-2) extracting the skeleton from the obtained distance map.

4. (previously presented): The method of claim 2, wherein the step (b) comprises:

(b-1) thinning the extracted skeleton; and

(b-2) extracting the first list of straight lines by connecting respective pixels within the thinned skeleton.

5.   (original): The method of claim 2, wherein the step (b) comprises:

(b-1) making a list of starting points and ending points of the connected lines; and

(b-2) obtaining the first list of straight lines by a straight line combination of the extracted straight lines;

and the step (c) comprises:

(c-1) determining the second list of straight lines, obtained by normalizing the first list of straight lines based on the maximum distance between ending points of respective straight lines, as the shape descriptor.

6.   (previously presented): The method of claim 3, wherein the distance transform is based on a function indicating respective points within an object with the minimum distance value of the corresponding point from a background.

7.   (original): The method of claim 3, wherein the step (a-2) comprises: obtaining a local maximum from the distance map using an edge detecting method.

8.   (Previously Presented): A shape descriptor extracting method comprising:

(a) extracting a skeleton from an input image;

(b) obtaining a first list of straight lines by connecting pixels based on the extracted skeleton; and

(c) determining a second list of straight lines obtained by normalizing the first list of

straight lines as a shape descriptor,

wherein the step (a) comprises:

(a-1) obtaining a distance map by performing a distance transform on the input image;

and

(a-2) extracting the skeleton from the obtained distance map,

the step (a-2) comprises: obtaining a local maximum from the distance map using an edge

detecting method, and

the step (a-2) comprises:

(a-2-1) performing a convolution using a local maximum detecting mask of four

directions to obtain the local maximum.

9.   (original): The method of claim 8, after the step (a-2-1), further comprising:

(a-2-2) recording a level corresponding to a direction having the greatest size on a

direction map and a magnitude map.

10.   (original): The method of claim 2, wherein the input image is a binary image.

11.   (Previously Presented): A shape descriptor extracting method comprising:

(a) extracting a skeleton from an input image;

(b) obtaining a first list of straight lines by connecting pixels based on the extracted

skeleton; and

(c) determining a second list of straight lines obtained by normalizing the first list of

straight lines as a shape descriptor,

wherein the step (b) further comprises:

(b-1) thinning the extracted skeleton; and

(b-2) extracting the first list of straight lines by connecting respective pixels within the

thinned skeleton, and

the step (b-1) comprises:

leaving a pixel having the greatest size in a direction rotated by 90-degrees from the

corresponding direction on the direction map, and removing the rest of the pixels.

12.   (Previously Presented): A shape descriptor extracting method comprising:

(a) extracting a skeleton from an input image;

(b) obtaining a first list of straight lines by connecting pixels based on the extracted

skeleton; and

(c) determining a second list of straight lines obtained by normalizing the first list of

straight lines as a shape descriptor,

wherein the step (b) comprises:

(b-1) thinning the extracted skeleton; and

(b-2) extracting the first list of straight lines by connecting respective pixels within the

thinned skeleton, and

the step (b-2) comprises:

using the direction map of four directions, and making a list of starting points and ending

points of respective line segments by connecting pixels having the same level on the direction

map.

13.   (original): The method of claim 5, wherein the step (b-2) comprises:

performing a straight line combination by changing threshold values of an angle between

the straight lines, a distance, and a length of a straight line from the obtained first list of straight

lines.

14.   (original): The method of claim 13, wherein the straight line combination is

repeated until the number of remaining straight lines becomes equal to or less than a

predetermined number.

15.   (withdrawn): An image searching method, wherein a method for searching for

images having similar shapes to a query image comprises:

(a) obtaining a list of straight lines from a shape descriptor of a query image;

(b) comparing the list of straight lines of a shape descriptor of a detected image with the

list of straight lines of the shape descriptor of the query image, and obtaining dissimilarity; and

(c) detecting images having similar shapes to the query image based on the obtained

dissimilarity.

16.   (withdrawn): The method of claim 15, wherein the step (b) comprises:

(b-1) measuring distances between ending points of the straight lines forming a skeleton;

and

(b-2) determining the sum of minimum values of the measured distances as the

dissimilarity.

17.   (withdrawn): The method of claim 16, wherein the step (b-1) comprises:

when Q is a straight line for detecting, M is a detected straight line, S is a starting point of

any straight line, E is an ending point of any straight line, N_Q is the total number of the straight

lines which the shape descriptor of the query image has, N_M is the total number of the straight

lines which the shape descriptor of the detected image has, and N is $N = \min\{N_Q, N_M\}$

calculating distances between ending points of the straight lines forming the skeleton according

to

$$D_{1k} = \underset{ij}{\min}\left\{\left\|Q_{S_i} - M_{S_j}\right\| + \left\|Q_{E_i} - M_{E_j}\right\|\right\} D_{2k} = \underset{ij}{\min}\left\{\left\|Q_{S_i} - M_{S_j}\right\| + \left\|Q_{E_i} - M_{E_j}\right\|\right\}$$

and the step (b-2) comprises:

measuring dissimilarity using a dissimilarity specific function defined as

$$D = \sum_{k=0}^{N-1} \min\{D_{1k}, D_{2k}\}$$

18.   (withdrawn): The method of claim 17, wherein a similarity measurement is

performed according to the steps (b-1) and (b-2) at regular intervals of a rotating angle to obtain

a value which is not changed by the rotation.

19.   (withdrawn): A dissimilarity measuring method, wherein a method for measuring

dissimilarity between images indexed using a shape descriptor formed on the basis of a skeleton

comprises:

(a) obtaining a list of straight lines from a shape descriptor of a query image; and

(b) comparing a list of straight lines from a shape descriptor of a detected image with the

list of straight lines of a shape descriptor of a query image, and obtaining dissimilarity.

20.   (previously presented): The method of claim 2, wherein the step (a) comprises:

(a-1) obtaining a map of the input image; and

(a-2) extracting the skeleton from the obtained map.

21.   (cancelled).

22. (new): The method of claim 2, wherein (b) comprises using the direction map of four

directions, and making a list of starting points and ending points of respective line segments by

connecting pixels having the same level on the direction map.

23. (new): The method of claim 2, wherein the direction maps of the plurality of

directions comprise masks of the plurality of directions.

24. (new): The method of claim 2, wherein pixels of the skeleton not having the same

level on the direction maps of the plurality of directions are not connected.